REMARKS

In view of the following discussion, the Applicants submit that none of the claims now pending in the application is anticipated under the provisions of 35 U.S.C. § 102 or made obvious under the provisions of 35 U.S.C. § 103. Thus, the Applicants believe that all of these claims are now in allowable form.

I. REJECTION OF CLAIMS 1-3, 5, 17 AND 20-21 UNDER 35 U.S.C. § 102

The Examiner has rejected claims 1-3, 5, 17 and 20-21 under 35 U.S.C. §102(e) as being anticipated by the Jamoussi et al. patent (United States Patent No. 6,128,280, issued on October 3, 2000, hereinafter "Jamoussi"). In response, the Applicants have amended independent claims 1 and 20, from which claims 2-3, 5 and 21 depend, as well as independent claim 17, in order to more clearly recite aspects of the present invention.

Jamoussi teaches an apparatus for dynamic connection bandwidth control. Specifically, Jamoussi teaches that an inverse multiplexer for asynchronous transfer mode (ATM) functional processor (IMAFP) card is associated with a plurality of connection pools, each connection pool associated with a different connection type (*e.g.*, constant bit rate, real-time variable bit rate, or non-real-time variable bit rate). Each pool is further associated with a bandwidth provided (*i.e.*, a percentage of bandwidth serviced by the IMAFP card), a pool available bandwidth (*i.e.*, the available bit rate based on the bandwidth provided), a pool admitted bandwidth (*i.e.*, the bandwidth currently being used by call connections associated with the pool) and a pool elastic bandwidth (*i.e.*, the bandwidth currently being used by elastic call connections).

The Examiner's attention is directed to the fact that Jamoussi fails to teach, show or suggest a method for transmitting packets in which a packet class is assigned both a nominal packet departure rate and a minimum allocation of available bandwidth (*i.e.*, a fixed lower limit of bandwidth), as recited by the Applicants' amended independent claims 1, 17 and 20. In particular, the Applicants' claims 1, 17 and 20, as amended, positively recite:

1. In a network comprising a plurality of router nodes connected in the network by communication links, a method of providing quality of service assurances for transmitting packets over a channel that transmits at at least at a nominal bandwidth, the method comprising:

defining a plurality of classes, each of the classes representing an aggregate behavior of packets;

allocating to each of the classes a nominal departure rate at which the packets of that class are transmitted when an available bandwidth of the channel is substantially operating at the nominal bandwidth; and

assuring each of the classes a minimum allocation of the available bandwidth for transmitting packets of that class if the available bandwidth of the channel is operating at less than the nominal bandwidth, the minimum allocation representing a fixed lower limit of bandwidth allocated to that class,

wherein at least one of: the nominal departure rate or the minimum allocation is dynamically changeable. (Emphasis added)

17. In a network, a router node that supports differentiated services, the router node comprising:

a classifier defining a plurality of classes, each of the classes representing an aggregate behavior of packets;

an allocater allocating to each of the classes a nominal departure rate at which the packets of that class are transmitted when an available bandwidth of a channel that transmits at at least at a nominal bandwidth is substantially operating at the nominal bandwidth; and

a rate prioritizer assigning each of the classes a minimum allocation of the available bandwidth for transmitting packets of that class if the available bandwidth of the channel is operating at less than the nominal bandwidth, the minimum allocation representing a fixed lower limit of bandwidth allocated to that class,

wherein at least one of: the nominal departure rate or the minimum allocation is dynamically changeable. (Emphasis added)

20. An article of manufacture having computer-readable program means embodied thereon for providing quality of service assurances for transmitting packets over a channel that transmits at at least at a nominal bandwidth, the article comprising:

computer-readable means for defining a plurality of classes, each of the class classes representing an aggregate behavior of packets;

computer-readable means for allocating to each of the classes a nominal departure rate at which the packets of that class are transmitted when an available bandwidth of the channel is substantially operating at the nominal bandwidth; and

computer-readable means for assuring each of the classes a minimum

> allocation of the available bandwidth for transmitting packets of that class if the available bandwidth of the channel is operating at less than the nominal bandwidth, the minimum allocation representing a fixed lower limit of bandwidth allocated to that class,
>
> wherein at least one of: the nominal departure rate or the minimum allocation is dynamically changeable. (Emphasis added)

The Applicants' invention is directed to a per hop behavior for DiffServ in mobile ad hoc wireless networks. Approaches for QoS designed for fixed wired networks tend to be inadequate for wireless networks due to the unpredictability of their behavior. In particular, the dynamic nature of wireless network topologies (*e.g.*, due to the mobility of the linked devices) and the peculiarities of signal propagation over wireless links (which tend to cause frequent changes to the states of the links) often cause a wireless network to be subject to higher data losses and more frequent bandwidth reallocations than traditional wired networks.

The Applicants' invention attempts to address this inadequacy by providing a per hop behavior for differentiated services in mobile ad hoc wireless networks. For example, in one embodiment, the Applicants provide a method whereby bandwidth for a link capable of transmission at a nominal bandwidth is allocated among a plurality of packet classes. At any given time, the specific amount of bandwidth allocated to a given class depends on how much of the nominal bandwidth is being consumed. Thus, each class is associated with: (1) a nominal departure rate at which the packets of that class are transmitted when an available bandwidth of the channel is substantially operating at the nominal bandwidth; and (2) a minimum allocation of the available bandwidth for transmitting packets of that class if the available bandwidth of the channel is operating at less than the nominal bandwidth. Either or both of the nominal departure rate and the minimum allocation of the available bandwidth is dynamically changeable, such that it/they may be adjusted to compensate for changing bandwidth availability resulting from changing network topology (*e.g.*, changes in link conditions). Thus, the Applicants' invention may be particularly well-suited for implementation in applications for wireless links and/or highly mobile networked devices.

By contrast, Jamoussi teaches a method in which bandwidth losses result in a

pool's allocated bandwidth being reduced by an unspecified amount. Thus, Jamoussi does not teach, show or suggest a method for attaining per-hop behavior for a plurality of classes of packet traffic in which a packet class is assigned both a nominal packet departure rate and a minimum allocation or fixed lower limit of available bandwidth.

Specifically, the cited portions of Jamoussi at most teach that pools (or classes) are allocated a specific percentage of the total available bandwidth. When the total available bandwidth is reduced (*e.g.*, due to link failure), the bandwidth loss is distributed among the pools according to the percentages of total bandwidth allocated thereto. As taught by Jamoussi, the bandwidth loss amount for a given pool is calculated by multiplying the amount of bandwidth loss by the bandwidth provided (*i.e.*, the percentage) to that pool (*See*, Jamoussi, column 8, line 66 to column 9, line 15). Thus, the bandwidth allocated to a pool, as taught by Jamoussi, may be reduced by an unspecified or unlimited amount, depending on the amount of bandwidth loss (*i.e.*, the bandwidth loss amount for a pool is directly proportional to the total amount of bandwidth lost). This is not the same as providing a pool (or class) with a minimum allocation of bandwidth (*i.e.*, a guaranteed lower limit) when bandwidth falls below a nominal amount. Thus, Jamoussi fails to teach, show or suggest a method for attaining per-hop behavior for a plurality of classes of packet traffic in which a packet class is assigned both a nominal packet departure rate and a minimum allocation (fixed lower limit) of available bandwidth, as recited in Applicants' amended independent claims 1, 17 and 20. Thus, the Applicants respectfully submit that claims 1, 17 and 20, as amended, fully satisfy the requirements of 35 U.S.C. §102 and are patentable thereunder.

Dependent claims 2-3, 5, and 21 depend from claims 1 and 20 and recite additional features therefore. As such, and for at least the reasons set forth above, the Applicants submit that claims 2-3, 5, and 21 are not anticipated by the teachings of Jamoussi. Therefore, the Applicants submit that dependent claims 2-3, 5, and 21 also fully satisfy the requirements of 35 U.S.C. §102 and are patentable thereunder.

II. REJECTION OF CLAIMS 4, 6-14 AND 18-19 UNDER 35 U.S.C. § 103

1. Claims 4, 10 and 13-14

The Examiner rejected claims 4, 10 and 13-14 under 35 U.S.C. §103(a) as being unpatentable over Jamoussi in view of the Soumiya et al. patent (United States Patent No. 5,818,818, issued October 6, 1998, hereinafter "Soumiya"). In response, the Applicants have amended independent claim 1, from which claims 4, 10 and 13-14 depend, in order to more clearly recite aspects of the present invention.

As discussed, Jamoussi fails to teach, show or suggest a method for attaining per-hop behavior for a plurality of classes of packet traffic in which a packet class is assigned both a nominal packet departure rate and a minimum allocation (*i.e.*, a fixed lower limit) of available bandwidth, as positively recited by Applicants' amended independent claim 1. Soumiya similarly fails to teach or suggest assigning a nominal packet departure rate and a minimum allocation of available bandwidth; thus, Soumiya does not bridge the gap in the teachings of Jamoussi. Therefore, the Applicants submit that for at least the reasons set forth above, independent claim 1, as amended, fully satisfies the requirements of 35 U.S.C. §103 and is patentable thereunder.

Dependent claims 4, 10 and 13-14 depend from claim 1 and recite additional features therefore. As such, and for at least the reasons set forth above, the Applicants submit that claims 4, 10 and 13-14 are not made obvious by the teachings of Jamoussi in view of Soumiya. Therefore, the Applicants submit that dependent claims 4, 10 and 13-14 also fully satisfy the requirements of 35 U.S.C. §103 and are patentable thereunder.

2. Claims 6-9 and 18-19

The Examiner rejected claims 6-9 and 18-19 under 35 U.S.C. §103(a) as being unpatentable over Jamoussi. In response, the Applicants have amended independent claims 1 and 17, from which claims 6-9 and 18-19 depend, as discussed above, in order to more clearly recite aspects of the present invention.

Jamoussi has been discussed above. As discussed, Jamoussi fails to teach, show or suggest a method for attaining per-hop behavior for a plurality of classes of

packet traffic in which a packet class is assigned both a nominal packet departure rate and a minimum allocation (*i.e.*, a fixed lower limit) of available bandwidth, as positively recited by Applicants' amended independent claims 1 and 17. Therefore, the Applicants submit that for at least the reasons set forth above, independent claims 1 and 17, as amended, fully satisfy the requirements of 35 U.S.C. §103 and are patentable thereunder.

Dependent claims 6-9 and 18-19 depend from claims 1 and 17 and recite additional features therefore. As such, and for at least the reasons set forth above, the Applicants submit that claims 6-9 and 18-19 are not made obvious by the teachings of Jamoussi. Therefore, the Applicants submit that dependent claims 6-9 and 18-19 also fully satisfy the requirements of 35 U.S.C. §103 and are patentable thereunder.

3. Claim 11

The Examiner rejected claim 11 under 35 U.S.C. §103(a) as being unpatentable over Jamoussi in view of Soumiya and further in view of the Vaman et al. patent (United States Patent No. 6,011,780, issued January 4, 2000, hereinafter "Vaman"). In response, the Applicants have amended independent claim 1, from which claim 11 depends, as discussed above in order to more clearly recite aspects of the present invention.

As discussed, Jamoussi and Soumiya fail to teach, show or suggest a method for attaining per-hop behavior for a plurality of classes of packet traffic in which a packet class is assigned both a nominal packet departure rate and a minimum allocation of available bandwidth, as positively recited by Applicants' amended independent claim 1. Vaman similarly fails to teach or suggest assigning a nominal packet departure rate and a minimum allocation of available bandwidth; thus, Vaman does not bridge the gap in the teachings of Jamoussi and Soumiya. Therefore, the Applicants submit that for at least the reasons set forth above, independent claim 1, as amended, fully satisfies the requirements of 35 U.S.C. §103 and is patentable thereunder.

Dependent claim 11 depends from claim 1 and recites additional features therefore. As such, and for at least the reasons set forth above, the Applicants submit

that claim 11 is not made obvious by the teachings of Jamoussi in view of Soumiya and further in view of Vaman. Therefore, the Applicants submit that dependent claim 11 also fully satisfies the requirements of 35 U.S.C. §103 and is patentable thereunder.

4. Claim 12

The Examiner rejected claim 12 under 35 U.S.C. §103(a) as being unpatentable over Jamoussi in view of the Kuehnel et al. patent (United States Patent No. 5,907,542, issued May 25, 1999, hereinafter "Kuehnel"). In response, the Applicants have amended independent claim 1, from which claim 12 depends, as discussed above in order to more clearly recite aspects of the present invention.

As discussed, Jamoussi fails to teach, show or suggest a method for attaining per-hop behavior for a plurality of classes of packet traffic in which a packet class is assigned both a nominal packet departure rate and a minimum allocation of available bandwidth, as positively recited by Applicants' amended independent claim 1. Kuehnel similarly fails to teach or suggest assigning a nominal packet departure rate and a minimum allocation of available bandwidth; thus, Kuehnel does not bridge the gap in the teachings of Jamoussi. Therefore, the Applicants submit that for at least the reasons set forth above, independent claim 1, as amended, fully satisfies the requirements of 35 U.S.C. §103 and is patentable thereunder.

Dependent claim 12 depends from claim 1 and recites additional features therefore. As such, and for at least the reasons set forth above, the Applicants submit that claim 12 is not made obvious by the teachings of Jamoussi in view of Kuehnel. Therefore, the Applicants submit that dependent claim 12 also fully satisfies the requirements of 35 U.S.C. §103 and is patentable thereunder.

III. CONCLUSION

Thus, the Applicants submit that all of the presented claims now fully satisfy the requirements of 35 U.S.C. §102 and 35 U.S.C. §103. Consequently, the Applicants believe that all the presented claims are presently in condition for allowance. Accordingly, both reconsideration of this application and its swift passage to issue are

earnestly solicited.

If, however, the Examiner believes that there are any unresolved issues requiring the maintenance of the final action in any of the claims now pending in the application, it is requested that the Examiner telephone Mr. Kin-Wah Tong, Esq. at (732) 530-9404 so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Respectfully submitted,

1/3/07
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